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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/940,512	08/29/2001	Stuart T. Stanton	3731-0177P	5220

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EXAMINER
DAY, HERNG DER

ART UNIT	PAPER NUMBER
2128	

DATE MAILED: 06/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/940,512	STANTON, STUART T.	
	Examiner	Art Unit	
	Herng-der Day	2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 February 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03 February 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This communication is in response to Applicant's Amendment ("Amendment") to Office Action dated November 5, 2004, mailed January 31, 2005, and received by PTO February 3, 2005.

1-1. Claim 1, 5-9, and 13-15 have been amended. Claims 17-20 have been added. Claims 1-20 are pending.

1-2. Claims 1-20 have been examined and rejected.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1-4 and 9-12 are rejected under 35 U.S.C. 102(b) as being anticipated by Stanton et al., "Initial Wafer Heating Analysis for a SCALPEL Lithography System", Microelectronic Engineering, Volume 46, Issues 1-4, May 1999, pages 235-238.

3-1. Regarding claim 1, Stanton et al. disclose a projection electron lithography system, comprising:

a lithography tool for emitting a beam of electrons (SCALPEL tool, section 1, first paragraph, page 235) and producing measurement information (Alignment Sensor, Figure 5, page 238); and

a processor including,

at least one pre-existing model for producing predictive information (Model: (pattern + operating state), Figure 5, page 238), and

an estimator for controlling placement of the beam of electrons based on the predictive information from said at least one pre-existing model and measurement information from said lithography tool (Measurement Update: Compute Kalman gain, measure to update position & error estimates, Figure 5, page 238).

3-2. Regarding claim 2, Stanton et al. further disclose said estimator compensates for heating and beam drift effects (expansion-induced pattern placement errors will require a sub-field position correction strategy, abstract, page 235).

3-3. Regarding claim 3, Stanton et al. further disclose said estimator is a Kalman filter, using least-squares based linear matrix algebra (Kalman filter methodology, Figure 5, page 238).

3-4. Regarding claim 4, Stanton et al. further disclose said system is a SCALPEL system (SCALPEL tool, section 1, first paragraph, page 235).

3-5. Regarding claim 9, Stanton et al. disclose a process for controlling projection electron lithography, comprising:

emitting a beam of electrons (Electron-beam Lithography, section 1, first paragraph, page 235);

producing measurement information on said emitting step (Alignment Sensor, Figure 5, page 238);

producing predictive information related to the projection electron lithography process based on at least one pre-existing model (Model: (pattern + operating state), Figure 5, page 238), and

controlling placement of the beam of electrons based on the predictive information and the measurement information (Measurement Update: Compute Kalman gain, measure to update position & error estimates, Figure 5, page 238).

3-6. Regarding claim 10, Stanton et al. further disclose said controlling step is implemented as a Kalman filter using least-squares based linear matrix algebra (Kalman filter methodology, Figure 5, page 238).

3-7. Regarding claim 11, Stanton et al. further disclose said controlling step compensates for heating and beam drift effects (expansion-induced pattern placement errors will require a sub-field position correction strategy, abstract, page 235).

3-8. Regarding claim 12, Stanton et al. further disclose said process is a SCALPEL process (SCALPEL tool, section 1, first paragraph, page 235).

4. Claims 1-3, 5-11, and 13-19 are rejected under 35 U.S.C. 102(e) as being anticipated by Shiraishi, U.S. Patent 6,243,158 issued June 5, 2001, and filed August 4, 1997.

4-1. Regarding claim 1, Shiraishi discloses a projection electron lithography system, comprising:

a lithography tool for emitting a beam of electrons (projection exposure apparatus, FIG. 1) and producing measurement information (measuring a baseline data, column 3, lines 33-37); and

a processor including,

at least one pre-existing model for producing predictive information (at least one baseline data measured previously, column 3, lines 37-41), and

an estimator for controlling placement of the beam of electrons based on the predictive information from said at least one pre-existing model and measurement information from said lithography tool (aligning the projected image, column 3, lines 37-45).

4-2. Regarding claim 2, Shiraishi further discloses said estimator compensates for heating and beam drift effects (the effects of this change can be minimized, column 7, lines 55-64).

4-3. Regarding claim 3, Shiraishi further discloses said estimator is a Kalman filter, using least-squares based linear matrix algebra (Kalman filter, column 8, lines 4-11).

4-4. Regarding claim 5, Shiraishi further discloses said at least one pre-existing model includes a plurality of different pre-existing models and said Kalman filter is an adaptive Kalman filter, wherein said adaptive Kalman filter iteratively selects one of said plurality of different pre-existing models until a best one of said plurality of different pre-existing models emerges (one, two, or more of the previously measured baseline measurement values, column 7, lines 28-40).

4-5. Regarding claim 6, Shiraishi further discloses said at least one pre-existing model includes a plurality of different pre-existing models and said Kalman filter is an adaptive Kalman filter, said adaptive Kalman filter having a tunable strength parameter to determine an optimal adaptation weighting criterion (weighted average, column 7, lines 35-64).

4-6. Regarding claim 7, Shiraishi further discloses said plurality of different pre-existing models includes three or more pre-existing models (more of the previously measured baseline measurement values, column 7, lines 28-40).

4-7. Regarding claim 8, Shiraishi further discloses said plurality of different pre-existing models includes three or more models (more of the previously measured baseline measurement values, column 7, lines 28-40).

4-8. Regarding claim 9, Shiraishi discloses a process for controlling projection electron lithography, comprising:

emitting a beam of electrons (projection exposure apparatus, FIG. 1);

producing measurement information on said emitting step (measuring a baseline data, column 3, lines 33-37);

producing predictive information related to the projection electron lithography process based on at least one pre-existing model (baseline data measured previously, column 3, lines 37-41), and

controlling placement of the beam of electrons based on the predictive information and the measurement information (aligning the projected image, column 3, lines 37-45).

4-9. Regarding claim 10, Shiraishi further discloses said controlling step is implemented as a Kalman filter using least-squares based linear matrix algebra (Kalman filter, column 8, lines 4-11).

4-10. Regarding claim 11, Shiraishi further discloses said controlling step compensates for heating and beam drift effects (the effects of this change can be minimized, column 7, lines 55-64).

4-11. Regarding claim 13, Shiraishi further discloses the predictive information is produced by a plurality of different pre-existing models, wherein said controlling step iteratively selects one of said plurality of different models until a best one of said plurality of different models emerges (one, two, or more of the previously measured baseline measurement values, column 7, lines 28-40).

4-12. Regarding claim 14, Shiraishi further discloses the predictive information is produced by a plurality of different pre-existing models, wherein said controlling step has a tunable strength parameter to determine an optimal adaptation weighting criterion (weighted average, column 7, lines 35-64).

4-13. Regarding claim 15, Shiraishi further discloses the plurality of different models includes three or more models (more of the previously measured baseline measurement values, column 7, lines 28-40).

4-14. Regarding claim 16, Shiraishi further discloses the plurality of different models includes three or more models (more of the previously measured baseline measurement values, column 7, lines 28-40).

4-15. Regarding claim 17, Shiraishi discloses a projection electron lithography system, comprising:

a lithography tool for emitting a beam of electrons (projection exposure apparatus, FIG. 1) and producing measurement information (measuring a baseline data, column 3, lines 33-37); and

a processor including,

a plurality of different pre-existing models for producing predictive information (one, two, or more of the previously measured baseline measurement values, column 7, lines 28-40), and

an adaptive estimator that iteratively selects a best one of said plurality of pre-existing models and controls placement of said beam of electrons based on said predictive information from said best one and measurement information from said lithography tool (aligning the projected image, column 3, lines 37-45).

4-16. Regarding claim 18, Shiraishi further discloses said plurality of different pre-existing models are only directed to producing said predictive information for corrections associated with a die scale (die-by-die mode, column 8, lines 54-58).

4-17. Regarding claim 19, Shiraishi further discloses said adaptive estimator employs a tunable strength parameter to determine an optimal adaptation weighting criterion of said predictive information and said measurement information (weighted average, column 7, lines 35-64).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 4, 12, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiraishi, U.S. Patent 6,243,158 issued June 5, 2001, and filed August 4, 1997, in view of Felker et al., U.S. Patent 6,177,218 issued January 23, 2001, and filed March 15, 1999.

6-1. Regarding claim 4, Shiraishi discloses a projection electron lithography system in claim 1. However, Shiraishi fails to expressly disclose said system is a SCALPEL system.

Felker et al. disclose, "In recent years, lithographic processes in which a charged particle beam is used to delineate a pattern in an energy sensitive resist material have been developed. Such processes provide high resolution and high throughput. One such process is the SCALPEL® (scattering with angular limitation projection electron beam lithography) process" (Felker, column 1, lines 37-42).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Shiraishi to incorporate the teachings of Felker et al. to obtain the invention as specified in claim 4 because the SCALPEL® process provides high resolution and high throughput (Felker, column 1, lines 39-42).

6-2. Regarding claim 12, Shiraishi discloses a process for controlling projection electron lithography in claim 9. However, Shiraishi fails to expressly disclose said process is a SCALPEL process.

Felker et al. disclose, "In recent years, lithographic processes in which a charged particle beam is used to delineate a pattern in an energy sensitive resist material have been developed. Such processes provide high resolution and high throughput. One such process is the SCALPEL® (scattering with angular limitation projection electron beam lithography) process" (Felker, column 1, lines 37-42).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Shiraishi to incorporate the teachings of Felker et al. to

obtain the invention as specified in claim 12 because the SCALPEL® process provides high resolution and high throughput (Felker, column 1, lines 39-42).

6-3. Regarding claim 20, Shiraishi discloses a projection electron lithography system in claim 17. Shiraishi further discloses said estimator is an adaptive Kalman filter (Kalman filter, column 8, lines 4-11). However, Shiraishi fails to expressly disclose said system is a SCALPEL system.

Felker et al. disclose, "In recent years, lithographic processes in which a charged particle beam is used to delineate a pattern in an energy sensitive resist material have been developed. Such processes provide high resolution and high throughput. One such process is the SCALPEL® (scattering with angular limitation projection electron beam lithography) process" (Felker, column 1, lines 37-42).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Shiraishi to incorporate the teachings of Felker et al. to obtain the invention as specified in claim 20 because the SCALPEL® process provides high resolution and high throughput (Felker, column 1, lines 39-42).

Applicant's Arguments

7. Applicant argues the following:

7-1. Formal Matters and Objections

(1) "the Applicant has amended Figure 5(b) to comport with the detailed description in the original application" (page 8, paragraph 2, Amendment).

(2) "the Applicant has amended paragraph 29 of the original application to correct this informality." (page 8, paragraph 5, Amendment).

(3) "the Applicant amended Claim 15 to depend on Claim 13" (page 9, paragraph 2, Amendment).

7-2. Rejection of Claims 1-4 and 9-12 under 35 U.S.C. §102

(4) "Stanton teaches employing a model that is not pre-existing but a model that relies on the present operating state of the system" (page 9, paragraph 4, Amendment).

7-3. Rejection of Claims 1-3, 5-11 and 13-16 under 35 U.S.C. §102

(5) "Shiraishi does not employ a pre-existing model but uses a computation unit to derive baseline data based on present baseline data" (page 10, paragraph 3, Amendment).

7-4. Rejection of Claims 4 and 12 under 35 U.S.C. §103

(6) "the cited combination of Felker and Shiraishi does not teach or suggest each element of independent Claims 1 and 9 and does not provide a prima facie case of obviousness of Claims 4 and 12 which depend on Claims 1 and 9, respectively" (page 11, paragraph 4, Amendment).

Response to Arguments

8. Applicant's arguments have been fully considered.

8-1. Applicant's arguments (1)-(3) are persuasive. The objections to FIG. 5(b), specification, and claim 16 in Office Action dated November 5, 2004, have been withdrawn.

8-2. Applicant's arguments (4)-(6) are not persuasive. Applicant argues the prior art does not teach or employ a pre-existing model. The Examiner respectfully disagrees with the Applicant's arguments. For the purpose of claim examination with the broadest reasonable interpretation, any information produced by a model or used as a model output is produced by a pre-existing model.

Conclusion

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Herng-der Day whose telephone number is (571) 272-3777. The Examiner can normally be reached on 9:00 - 17:30. Any inquiry of a general nature or relating to the status of this application should be directed to the TC 2100 Group receptionist: (571) 272-2100.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Jean R. Homere can be reached on (571) 272-3780. The fax phone numbers for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Herng-der Day H.D.
June 7, 2005

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